

Global distribution of persistence of total electron content anomaly

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Solar activities can disturb the ionosphere globally and induce ionospheric weather phenomena that transit rapidly through a large area. By contrast, sometimes the ionospheric plasma density can remain high or low over a certain location for a few days, which are difficult to be attributed to solar activities. This study shows the location preference of the positive and negative total electron content (TEC) anomalies persisting continuously longer than 24 hours (cross the two terminators) at middle and low latitudes (within $\pm 60^\circ\text{N}$ geomagnetic latitudes). The TEC is obtained from the global ionospheric map (GIM) of the Center for Orbit Determination in Europe (CODE) under the geomagnetic quiet condition of Kp less than 3o during the period of 2005–2018. There are a few (less than 4%) TEC anomalies that can persist over 24 hours. The persistence of the positive TEC anomaly along the ring of fire on the western edge of the Pacific Ocean. The high persistence of the TEC anomalies at midlatitudes suggests that thermospheric neutral wind contributes to the anomaly formation. The temporal and spatial anomalies of the ionospheric electric field, atmospheric electric field (flash), atmospheric gravity wave, and neutral wind over the ring of fire should be further examined for explaining whether the persistence of the TEC anomalies associates with lithospheric activities.

Keywords: GNSS TEC, TEC persistence, ring of fire